

### REMARKS

Claims 3-15, 55-59 and 69-75 are currently pending for examination.

#### Double Patenting

Claims 3-15, 55-59, and 69-75 have been rejected under the judicially-created doctrine of obviousness-type double-patenting as being unpatentable over claims 1-13 of U.S. Patent No. 5,776,748. However, the Patent Office stated that a timely filed Terminal Disclaimer in compliance with 37 C.F.R. §1.321(c) may be used to overcome this rejection.

Without acceding to the correctness of this rejection, enclosed herewith is a Terminal Disclaimer with respect to U.S. Patent No. 5,776,748 in compliance with 37 C.F.R. §1.321(c) to overcome this rejection. In view of this Terminal Disclaimer, the rejection of claims 3-15, 55-59, and 69-75 on this ground are believed to have been overcome. Withdrawal of the rejection of claims 3-15, 55-59, and 69-75 is therefore respectfully requested.

Claims 3-15, 55-59, and 69-75 have also been rejected under the judicially-created doctrine of obviousness-type double-patenting as being unpatentable over claims 1-15 of U.S. Patent No. 5,976,826. However, the Patent Office stated that a timely filed Terminal Disclaimer in compliance with 37 C.F.R. §1.321(c) may be used to overcome this rejection.

Without acceding to the correctness of this rejection, enclosed herewith is a Terminal Disclaimer with respect to U.S. Patent No. 5,976,826 in compliance with 37 C.F.R. §1.321(c) to overcome this rejection. In view of this Terminal Disclaimer, the rejection of claims 3-15, 55-59, and 69-75 on this ground are believed to have been overcome. Withdrawal of the rejection of these claims is therefore respectfully requested.

#### Rejections of Claims 3-10 under 35 U.S.C. §102(b) in view of Clark

Claims 3-10 have been rejected under 35 U.S.C. §102(b) as being anticipated by Clark, et al., U.S. Patent No. 4,728,591 ("Clark").

Applicants do not see where Clark discloses or suggests a first molecular species terminating in an end having a functional group selected to bind to a surface. With respect to the recitation in claim 3 that the first molecular species terminates in an end exposed away from the surface having a first functionality, and terminates in another end having a functional group that is selected to bind to

the surface, it is not seen where this is disclosed or suggested in Clark. The Patent Office asserts that protein and enzyme molecules in Clark as having the functionality that meets this limitation, and points specifically to Col. 2, lines 49-55 ("A functional material to be used in the nanostructure is to be deposited onto the substrate surface through the holes"). However, this passage does not disclose or suggest that the protein or enzyme terminates in an end having a functional group selected to bind to a surface. In fact, this passage does not disclose or suggest a functional group at all (i.e., as this term is understood to those of ordinary skill in the art in the field of organic chemistry), but merely suggests that the material (e.g., the protein or enzyme) be one that is biologically active (Clark gives an example of a bacteriorhodopsin, which is photosensitive). See, e.g., Col. 3, lines 1-4 in Clark ("Composite devices, biomolecular-solid state heterostructures consisting of biologically active molecules and other functionable materials may be produced according to the present invention"). Although Clark states that the proteins may be bound to a surface, e.g., physically or electrostatically (see, e.g., col. 5, line 55 to col. 6, line 68), Clark nowhere discloses or suggests that the protein or enzyme includes a functional group at the terminal end of the protein or enzyme that is selected to bind to the surface.

In addition, the Patent Office appears to imply, in its rejection, that the first molecular species and the second molecular species in claim 3 each terminate in the same way. However, claim 3 recites that the first molecular species terminates in an end exposed away from the surface having a first functionality and terminates in another end having a functional group selected to bind to the surface, and that the second molecular species terminates in an end facing away from the surface having a second functionality. In particular, claim 3 does not recite that the first functionality and second functionality are the same or different.

The Patent Office also continues to equate the self-assembled molecular array of Clark with a self-assembled monolayer. However, Applicants disagree that these are the same thing. Applicants do not see where in Clark is there a disclosure or suggestion of a self-assembled monolayer. Although Clark discloses a self-assembled molecular array on a surface, which can contain holes through which material can be deposited, it is not seen where Clark discloses or suggests a self-assembled monolayer, as this term is understood by those of ordinary skill in the art. As has been previously discussed, Clark teaches that the self-assembled molecular array exhibits

density, thickness, and/or chemical reactivity variations (see, for example, Col. 2, lines 35-37), which those of ordinary skill in the art would not understand to be a self-assembled monolayer.

Thus, for at least these reasons, it is believed that Clark does not anticipate independent claim 3, and it is respectfully requested that the rejection of this claim be withdrawn. Claims 4-10 each depend from claim 3, and are believed to be allowable for at least the above-mentioned reasons. Withdrawal of rejection of these claims is also respectfully requested.

Rejections of Claims 55-59 and 69 under 35 U.S.C. §102(b) in view of Schnur

Claims 55-59 and 69 have been rejected under 35 U.S.C. §102(b) as being anticipated by Schnur, *et al.*, U.S. Patent No. 5,079,600 ("Schnur").

It is not seen where Schnur discloses or suggests a surface comprising palladium onto which a self-assembled layer is positioned, as is recited in independent claims 55 and 69. While Schnur discloses "palladium," it is in the context of a colloidal catalytic precursor (e.g., claim 6 or col. 6, lines 55-59) applied to a molecular layer on a surface, rather than forming a part of a surface onto which a self-assembled layer of a molecular species defining a pattern is provided, as is recited in claims 55 and 69.

For instance, the Patent Office points to Example 23 in its rejection. However, Example 23 (reproduced below in its entirety) does not disclose a surface comprising palladium onto which a self-assembled layer is positioned, but rather, a surface comprising *copper* which is produced using  $\text{PdCl}_2$  as an activator:

Fabrication of metal patterns using a two-stage surface activation system.

An n-type silicon wafer with about one-half micron of CVD oxide was cleaned and then treated with UTF3 as described in Example 9. The film was patterned with a low resolution mask and exposed with a Hg/Ar lamp for 30 min. The wafer was then treated for 3 minutes with a solution containing 10 g/L  $\text{SnCl}_2$  in 0.5 M HCl, rinsed three times with distilled water, then treated for 3 minutes with a solution with 0.25 g/L of  $\text{PdCl}_2$  in 0.05 M HCl and rinsed again. The wafer was then metallized using a standard copper plating bath to produce a very smooth copper film in the unirradiated areas of the film. Upon observation by optical reflection microscopy, the plated film appeared to be smoother than the copper coatings produced using the commercial catalytic Pd/Sn activators described in previous examples.

*This result demonstrates that a two-stage tin and palladium activator system can be used to produce improved copper coatings.* It is possible to use alternate deposition schemes as well. [Emphasis added]

Similarly, in Example 1, also pointed to by the Patent Office in its rejection, palladium chloride colloidal activator was used to prepare a wafer for copper plating. This is discussed in detail in the second paragraph of Example 1, reproduced below:

XD2408-T palladium chloride/tin chloride colloidal activator (MacDermid Co., Waterbury, CT) was used as received. The silanized wafer surface was covered by the Pd/Sn colloidal activator for five minutes. The wafer was then rinsed copiously with water. The surface of the wafer was clearly hydrophilic, indicative of the bonding of the colloid. The wafer was then immersed for five minutes in a Metex 9027 electroless copper plating bath prepared in accordance with the manufacturer's (MacDermid) directions. The wafer, after removal from the bath, was thoroughly rinsed with water. *A copper metal coat was visible over the surface of the wafer.* Examination of the surface of the wafer using a scanning electron microscope revealed the presence of a uniform, continuous metal coat on the wafers surface. [Emphasis added]

As the highlighted passage indicates, a wafer was covered with a PdCl<sub>2</sub> colloidal activator for 5 minutes, prior to being plated with copper, not palladium. Accordingly, Example 1 does not disclose or suggest a surface comprising palladium onto which a self-assembled layer is positioned.

The Patent Office also points to the Abstract of Schnur as a basis for rejecting claims 55 and 69, and the associated dependent claims. Applicants do not see "palladium" or the symbol "Pd" anywhere in the Abstract, which is reproduced below in its entirety. Thus, it is not clear what significance the Abstract has in the rejection of claims 55-59 and 69:

A process for producing metal plated paths on a solid substrate of the kind which has polar functional groups at its surface, utilizing a self-assembling film that is chemically absorbed on the substrate's surface. The solid substrate may, for example, be an insulator of the kind used for substrates in printed circuitry or may, as another example, be a semiconductor of the kind used in semiconductor microcircuitry. The chemical reactivity in regions of the ultra-thin film is altered to produce a desired pattern in the film. A catalytic precursor which adheres only to those regions of the film having enough reactivity to bind the catalyst is applied to the film's surface. The catalyst coated structure is then immersed in an electroless plating bath where metal plates onto the regions activated by the catalyst.

Similarly, the Patent Office also points to Example 25 as a basis for rejecting claims 55 and 69, and the associated rejected dependent claims. However, it is not seen where in Example 25 is “palladium” or the symbol “Pd” disclosed. Accordingly, the significance of Example 25 is unclear to the Applicants. Example 25 is reproduced below in its entirety:

**Demonstration of step coverage on polysilicon**

A 400 nm thick layer of p-type polysilicon was deposited onto a n-type silicon wafer that had previously been covered with a series of parallel CVD oxide lines that were 10 or 20 microns wide and 400 nm thick. The wafer was then cleaned and treated with UTF3 as described in Example 9. The film was patterned by irradiation for 28 minutes with a Hg/Ar lamp using the same parallel line mask oriented at 90° to the CVD oxide lines. The film was metallized using the standard copper plating procedure. The resulting copper lines were found to be continuous, of uniform thickness and accurately followed the contours of the polysilicon steps.

This result demonstrates excellent step coverage which is important in the fabrication of gates and interconnects in non-planar regions of the wafer.

Accordingly, it is believed that Schnur nowhere discloses or suggests a surface comprising palladium onto which a self-assembled layer is positioned, as is disclosed in claims 55-59 and 69. Thus, withdrawal of the rejection of these claims is respectfully requested.

**Rejections of Claims 11-15 under 35 U.S.C. §103(a) in view of Clark and Schnur**

Claims 11-15 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Clark in view of Schnur.

Claims 11-15 each depend, either directly or indirectly, from claim 3 (the Patent Office suggests that these claims depend from claim 1, not claim 3, but this appears to be a typographical error on the part of the Patent Office). For at least the reasons explained above with respect to the rejection under §102(b) in view of Clark, the premise of the rejection of claim 3 (that Clark teaches all of the limitations of claim 3) is believed to be incorrect. Accordingly, while Applicants do not concede that there would have been any suggestion or motivation to combine Clark and Schnur in the manner suggested in the Office Action, the present rejection cannot stand, regardless. Thus, withdrawal of the rejection of claims 11-15 is respectfully requested.

Rejection of Claims 55-59 and 69-75 under 35 U.S.C. §103(a) in view of Clark and Schnur

Claims 55-59 and 69-75 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Clark in view of Schnur.

As previously discussed, neither Clark nor Schnur disclose or suggest an article defining a surface comprising palladium onto which a self-assembled layer is positioned. Clark nowhere discloses or suggests palladium, and Schnur has been discussed above with respect to palladium. Accordingly, to the extent that these references could be combined (which Applicants do not concede, as discussed below), it is not seen how their combination would result in an article defining a surface comprising palladium onto which a self-assembled layer is positioned.

Moreover, the Patent Office also suggests that Clark and Schnur could be combined because “Schnur teaches a substrate of silicon and the use of palladium on a silicon wafer substrate produces a smooth coating (Example 23, Abstract, Example 25, Schnur). Thus, the claimed invention would produce the same invention and perform in the same way as Applicant as the same materials [] provided by the prior art.” See page 7 of the Office Action. The Patent Office appears to indicate that the motivation to combine Clark and Schnur would be to produce a “smooth coating.” However, this appears to be speculation on the part of the Patent Office, as Clark does not disclose that a smooth coating would be desirable. Furthermore, the Patent Office has not explained, even if a smooth coating was desirable, why one of ordinary skill in the art would combine Clark with Schnur. For example, a smooth coating could be formed using a range of different materials, including other metals such as gold, silver, or platinum, or even glass, and the Patent Office has not provided an explanation of why a person of ordinary skill in the art, in considering Clark, would be motivated to choose palladium in forming a smooth coating, instead of other, more commonly-available materials such as gold or silver.

Furthermore, it is not clear to the Applicants why palladium and silicon could be considered to be equivalent, and the Patent Office has not pointed to any such teaching. Palladium is a metal, while silicon is a semiconductor, and the electrical behavior of palladium and silicon would therefore be expected to be quite different. In Clark, silicon is used since it has various intrinsic solid state properties that can be used to construct an electronic device (see, e.g., Col. 2, lines 32-

38); however, Applicants are not aware, and the Patent Office has not pointed to any such teaching, of a device that is fabricated using palladium as a substrate for the basis of an electronic device.

Accordingly, for at least the above-mentioned reasons, it is believed that the combination of Clark and Schnur is improper, and withdrawal of the rejection of claims 55 and 69 is respectfully requested. The remaining claims each depend, directly or indirectly, from independent claims 55 or 69, and are believed to be allowable for at least the same reasons. Withdrawal of the rejection of these claims is also respectfully requested.

Rejections of Claims 3-15 under 35 U.S.C. §103(a) in view of Schnur and Clark

Claims 3-15 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Schnur in view of Clark.

It is not clear why one of ordinary skill in the art would combine Schnur and Clark, and the Patent Office has not shown a teaching, suggestion, or motivation for doing so. As discussed above, Schnur is directed to high-resolution patterning of metals, such as copper, on a substrate for use in printed circuitry (e.g., in semiconductor microcircuitry). See, e.g., the Abstract. Clark, on the other hand, is not concerned with patterning techniques, but rather is directed to producing a layer of proteins on a surface (see, e.g., the Summary of the Invention). It is not seen why one of ordinary skill in the art, in considering a reference for plating metals on a substrate (i.e., Schnur), would be motivated to substitute proteins instead of metals on the substrate, as is taught in Clark, as proteins are not structurally equivalent to metals such as copper, and do not have similar electronic properties.

Without providing an objective teaching, suggestion, or motivation in the prior art that would lead one of ordinary skill in the art to combine Schnur and Clark the Patent Office's statements are unsupported, and cannot be distinguished from mere speculation or hindsight reasoning, which is impermissible. Accordingly, it is believed that the Patent Office has not provided a *prima facie* case of obviousness under 35 U.S.C. §103(a) in view of Schnur and Clark. It is thus believed that claims 3-15 are patentable over the combination of Schnur and Clark, and it is therefore respectfully requested that the rejection of these claims be withdrawn.

Rejections of Claims 70-75 under 35 U.S.C. §103(a) in view of Schnur and Clark

Claims 70-75 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Schnur in view of Clark.

Each of claims 70-75 ultimately depends from claim 69. For at least the above-described reasons with respect to Schnur alone, the premise of the rejection of claim 69 (that Schnur teaches all of the limitations of claim 69) is believed to not be correct. Accordingly, while Applicants do not concede that there would have been any teaching, suggestion, or motivation to combine Schnur and Clark in the manner suggested in the Office Action, the present rejection cannot stand, regardless. Thus, withdrawal of the rejection of claims 70-75 is respectfully requested.

CONCLUSION

In view of the foregoing, this application should now be in condition for allowance. A notice to this effect is respectfully requested. If the Examiner believes, after this response, that the application is not in condition for allowance, the Examiner is requested to call the undersigned at the telephone number listed below.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 23/2825.

Dated: 04/04/07

Respectfully submitted,

By 

Timothy J. Oyer, Ph.D.

Registration No.: 36,628

Tani Chen, Sc.D.

Registration No.: 52,728

WOLF, GREENFIELD & SACKS, P.C.

Federal Reserve Plaza

600 Atlantic Avenue

Boston, Massachusetts 02210-2206

(617) 646-8000